



Original/Deporte y ejercicio

Obese and unfit students dislike physical education in adolescence: myth or truth? The AVENA and UP&DOWN studies

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Abstract

Introduction: In the physical education context a well-known myth suggest that obese and unfit youth dislike physical education.

Objective: To examine if adolescents who dislike physical education have higher levels of fatness and lower of fitness than their peers.

Methods: Participants included 2606 (49.3% girls) adolescents from AVENA and UP&DOWN studies. physical education enjoyment was assessed with a 7-point Likert scale. Fatness was assessed with BMI, skinfolds and waist circumference. Physical fitness was assessed with cardiorespiratory, motor and muscular fitness tests.

Results: Boys who dislike physical education had similar levels of fatness and fitness than their peers (all $P>0.05$). Adolescent girls who dislike physical education had higher levels in body fat ($P=0.035$), and lower levels in muscular ($P=0.007$) and motor ($P=0.007$) fitness than their peers.

Conclusion: Since only girls who dislike physical education seem to have, albeit weak, higher levels of fatness and lower of fitness than their peers, it partially confirms the myth in adolescent girls.

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Key words: Physical education. Enjoyment. Adolescents. Obesity. Physical fitness.

A LOS ADOLESCENTES QUE NO LES GUSTA LA EDUCACIÓN FÍSICA TIENEN PEOR CONDICIÓN FÍSICA Y MÁS OBESIDAD: ¿MITO O REALIDAD? LOS ESTUDIOS AVENA Y UP&DOWN

Resumen

Introducción: En el contexto de la EF (educación física), un mito bien conocido podría sugerir que a los jóvenes obesos y con baja condición física no les gusta la EF.

Objetivo: Examinar si a los adolescentes a los que no les gusta la EF tienen niveles más altos de obesidad y niveles más bajos de forma física que sus compañeros.

Métodos: Se tomó a 2606 participantes (49.3% chicas) adolescentes de los estudios AVENA y UP&DOWN. El disfrute de la EF se evaluó empleando una escala Likert de 7 puntos. La obesidad se evaluó mediante el IMC, pliegues cutáneos y circunferencia de la cintura. La condición física fue evaluada mediante pruebas cardiorespiratorias, motoras y musculares.

Resultados: Los chicos a los que no les gusta la EF presentaron niveles similares de obesidad que sus compañeros (total $P>0.05$). Las chicas adolescentes a las que no les gusta la EF presentaron niveles más altos de grasa corporal ($P=0.035$), y niveles más bajos en condición física muscular ($P=0.007$) y motora ($P=0.007$) que sus compañeros.

Conclusión: Dado que solo las chicas a las que no les gusta la EF parecen presentar, sin bien levemente, niveles más altos de obesidad y niveles menores de forma física que sus compañeros, el mito se confirma parcialmente para las chicas adolescentes.

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Palabras clave: Educación física. Disfrute. Adolescentes. Obesidad. Condición física.

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Abbreviations

PE= Physical education.
PA= Physical activity.
BMI= Body mass index.
%BF: Percentage body fat.

Introduction

Physical education (PE) is one of the main agents to promote physical activity (PA) in youth¹. Dislike PE could limit their involvement in PA during classes as well as their learning to be physically active outside school. In the PE context a well-known myth suggest that those with activity limitations to engage in regular PA, like obese and unfit youth, dislike PE. However, there is no enough evidence to confirm this fact since previous studies that investigated fatness and fitness levels according to adolescents' PE enjoyment have limitations. For example, to the best of our knowledge, there is no study that examined the relationship between PE enjoyment and other indicators of fatness such as waist circumference or body fat because analyses were limited to body mass index (BMI) measurements^{2,3}. Furthermore, only one study investigated the relationship between PE enjoyment and cardiorespiratory fitness², and therefore, other components of physical fitness such as motor and muscular fitness have not been taken into consideration.

Thus, the aim of this study is to examine whether those adolescents who dislike PE have higher levels of different markers of fatness and lower levels of components of physical fitness than their peers.

Methods

The present study includes data from two different research projects: the AVENA and UP&DOWN studies. The AVENA study is a cross-sectional study designed to assess health and nutritional status in a representative sample of adolescents ($n=2859$) from five Spanish cities (Granada, Madrid, Murcia, Santander and Zaragoza) between 2000 and 2002. The UP&DOWN study is an ongoing 3-year longitudinal study designed to assess the impact over time of physical activity and sedentary behaviors on health indicators, as well as to identify the psycho-environmental and genetic determinants of physical activity in a convenience sample of Spanish children and adolescents. Baseline data collection was conducted between 2011 and 2012 in a sample of adolescents from Madrid ($n=1037$). A total of 2723 adolescents (1789 from the AVENA study and 939 from the UP&DOWN study) had valid data for all the studied variables. Families or legal guardians were informed on the protocols of both studies and gave their written consent. Both studies were approved by Ethics Committees^{4,5}.

Height, weight and waist circumference were measured with standardized procedures in both studies^{4,5}. BMI was calculated as body weight divided by height squared (kg/m^2). Overweight (including obesity) adolescents were classified according to age- and sex-specific cut off points proposed by the International Obesity Task Force⁶. Triceps and subscapular skinfold thicknesses were measured to the nearest 0.1 mm on the non-dominant side in the UP&DOWN study, and on the left side in the AVENA study. The percentage of body fat (%BF) was calculated following the Slaughter's equations⁷. Physical fitness was assessed in both studies using identical procedures. Cardiorespiratory fitness was assessed with the 20-m shuttle-run test. VO_2 max ($\text{ml}/\text{kg}/\text{min}$) was calculated with the Leger equation⁸. Muscular fitness was calculated as the mean of the handgrip test and the standing long jump test, after standardizing the individual score of each test in sex-specific z-values: Z-standardized value = (value - mean)/SD. Motor fitness was calculated as the fastest time in seconds assessed in the 4x10-m shuttle-run test¹⁰. PE enjoyment was assessed with a 7-point Likert scale with the following categories: 1. I don't have PE; 2. I don't attend PE; 3. I absolutely dislike PE; 4. I dislike PE; 5. I neither like nor dislike PE; 6. I like PE; 7. I absolutely like PE. Adolescents who rated categories 1 and 2 were excluded for the analyses. Then, three groups were performed: (i) don't like PE (categories 3 and 4), (ii) indifferent (category 5), and (iii) like PE (categories 6 and 7).

Statistical analyses were performed with SPSS for Windows, v.21.0. All the variables are presented as mean (SD) or percentages. Differences between sexes were examined by one-way analysis of variance and Chi-squared test for continuous and categorical variables, respectively. Initially, differences in fatness and fitness levels across the three groups of PE enjoyment (don't like PE classes, indifferent and like PE classes) were analyzed by analysis of covariance controlling for age, study (AVENA study, UP&DOWN study), and type of school (private, public). Bonferroni corrections were performed for pair-wise comparisons. Also, we analyzed group-wise differences in fatness and fitness between those who don't like PE vs. another options (i.e. indifferent and like PE classes), as well as between those who like PE and other options (i.e. indifferent and don't like PE) with analysis of covariance, after controlling for potential covariates. Additional analyses were performed including maternal education information (primary education; secondary education; university) and self-reported Tanner stage. The significance level was set at $P<0.05$ for all analyses.

Results

A total of 117 participants were excluded because they did not have or engage in PE classes, then 2606 adolescents (49.3% girls) were included in the final

analysis. The statistical data for the final sample, including a comparison between girls and boys, are shown in table I. For fatness measurements, boys had higher levels of waist circumference ($P<0.001$) than girls, but girls had higher levels in %BF ($P<0.001$) than boys. Although there were similar levels of BMI in both sexes ($P=0.112$), the prevalence of overweight (including obesity) was greater in boys than girls (27% vs. 20%, $P<0.001$). Boys had higher levels of physical fitness than girls in all variables. Around 9% and 55% of the total sample disliked and liked PE classes, respectively.

Levels of fatness and fitness according to PE enjoyment in adolescents are shown in table II. In boys we only found significant differences in motor fitness across groups of PE enjoyment ($P=0.024$). These differences were found between those who like PE and their peers ($P=0.007$), particularly with the indifferent group ($P=0.025$). In girls we found significant differences across groups of PE enjoyment in all studied variables (all $P<0.01$), with the exception of a marginally significant difference in levels of BMI ($P=0.082$). Adolescent girls who disliked PE had higher levels in %BF ($P=0.035$) and lower levels in muscular ($P=0.007$) and motor ($P=0.007$) fitness than their peers, especially when comparing with adolescents who like PE (all $P<0.01$). On the other hand, adoles-

cent girls who like PE had significantly better levels of fatness and fitness in all fatness and fitness variables than their peers (all $P<0.05$). Moreover, there was no relationship between dislike PE classes and the other two categories in the prevalence of being overweight (including obesity).

In additional analyses, when we introduced maternal education in the model as indicator of socioeconomic status, differences in motor fitness across groups of PE enjoyment were attenuated ($P=0.062$) in boys ($n=993$). In girls ($n=1065$), differences in %BF between girls who don't like and the other groups also were weakened ($P=0.065$). When including sexual maturation (Tanner stages) there were no changes in all analyses ($n=2193$).

Discussion

The results of the present study in a pooled analyses with two adolescent samples show that (i) boys who dislike PE do not have neither higher levels of fatness nor lower levels of physical fitness than their peers, and (ii) girls who dislike PE show slightly worse levels of fitness and fatness in 3 out of 6 studied variables, but these differences are weak and some disappeared in additional analyses.

Table I
Characteristics of the study sample

	All	Boys	Girls	P
<i>n</i>	2606	1321	1285	
Age (years)	14.5±1.6	14.4±1.5	14.5±1.6	0.140
Weight (kg)	58.0±12.3	61.0±13.5	54.8±10.1	<0.001
Height (cm)	164.3±9.5	168.0±10.3	160.4±6.8	<0.001
Private school (%)	37.3	40.2	34.4	0.003
Fatness				
Body mass index (kg/m ²)	21.4±3.5	21.5±3.6	21.3±3.4	0.112
Waist circumference (cm)	70.2±9.1	74.4±9.4	69.5±8.1	<0.001
Body fat (%)	22.2±9.0	19.4±10.1	25.1±6.5	<0.001
Overweight/Obesity (%)	23.8	27.1	20.3	<0.001
Fitness				
Muscular fitness (z-score x10)	0.0±8.5	0.0±8.9	0.0±8.1	1.000
Motor fitness (sec)	12.3±1.4	11.7±1.4	12.8±1.3	<0.001
Cardiorespiratory fitness (ml/kg/min)	45.0±8.4	48.9±8.5	40.9±6.1	<0.001
Physical education enjoyment				
Don't like physical education (%)	8.9	9.6	8.2	
Indifferent (%)	35.9	31.7	40.2	
Like physical education (%)	55.2	58.7	51.7	<0.001

Values are mean±SD or percentages.

Table II
Levels of fatness and fitness according to physical education (PE) enjoyment in adolescents, by sex

	PE enjoyment			<i>P</i> _{value}	Pair-wise comparisons			Group-wise comparisons		
	Don't like PE (1) Mean±SD	Indifferent (2) Mean±SD	Like PE (3) Mean±SD		I vs. 2	2 vs. 3	I vs. 3	I vs. 2+3	I+2 vs. 3	
Boys, n	127	419	775							
<i>Fatness</i>										
Body mass index (kg/m ²)	21.3±3.4	21.6±3.7	21.4±3.6	0.904	1.000	1.000	1.000	0.780	0.664	
Body fat (%)	19.5±9.4	19.2±9.9	19.5±10.2	0.808	1.000	1.000	1.000	0.524	0.905	
Waist circumference (cm)	74.9±9.7	75.1±9.5	74.3±9.3	0.831	1.000	1.000	1.000	0.825	0.544	
<i>Fitness</i>										
Muscular fitness (z-score x10)	-0.3±8.0	1.4±8.5	-0.7±9.2	0.592	1.000	0.920	1.000	0.969	0.354	
Motor fitness (sec)	11.8±1.7	11.8±1.6	11.7±1.1	0.024	1.000	0.025	0.611	0.468	0.007	
Cardiorespiratory fitness (ml/kg/min)	48.9±8.8	49.1±9.4	48.7±7.9	0.800	1.000	1.000	1.000	0.529	0.649	
Girls, n	105	516	664							
<i>Fatness</i>										
Body mass index (kg/m ²)	21.6±3.6	21.5±3.4	21.0±3.3	0.082	1.000	0.115	0.546	0.396	0.026	
Body fat (%)	26.4±6.9	25.8±6.7	24.5±6.2	0.001	0.789	0.008	0.016	0.035	<0.001	
Waist circumference (cm)	70.6±8.4	70.4±8.4	68.6±7.7	0.007	1.000	0.007	0.444	0.477	0.002	
<i>Fitness</i>										
Muscular fitness (z-score x10)	-1.0±7.8	-0.3±8.3	0.4±8.0	0.002	0.168	0.073	0.004	0.007	0.003	
Motor fitness (sec)	13.1±1.3	12.9±1.4	12.7±1.1	0.001	0.231	0.016	0.003	0.007	0.001	
Cardiorespiratory fitness (ml/kg/min)	41.0±8.1	40.1±5.7	41.6±6.1	<0.001	0.159	<0.001	1.000	0.512	<0.001	

Analyses were adjusted for age, study (AVENA study, UP&DOWN study), and type of school (private, public).

Regarding to fatness variables, previous studies have analyzed the relationship between PE enjoyment and BMI^{2,3}. Barr-Anderson *et al.* found a modest albeit significant association between higher levels of BMI and lower levels of PE enjoyment in girls. Our results, however, do not support such relationship neither in boys nor in girls. In agreement with our results Prochaska *et al.* found that BMI was not associated with PE enjoyment. In our study, another fatness variable such as %BF showed higher levels in those girls who dislike PE. Only 1 of the 3 variables of fatness presented higher levels in the group of girls who disliked PE.

As commented above, studies that related PE enjoyment to physical fitness are limited to one of their components – cardiorespiratory fitness. This investigation used the mille run test to assess VO₂ max. Their findings, however, do not match with our results because they found PE enjoyment was negatively correlated with mile-run time. In our study, we included other components of physical fitness, such as motor and muscular fitness, and girls who dislike PE had worst levels in both fitness variables. However, boys who dislike PE had similar levels in the 3 fitness variables than their peers. Those girls with lower levels of muscular and motor fitness may be at risk of disliking PE, which could affect their engagement in higher levels of PA.

In conclusion, it seems that boys who dislike PE have similar levels of fitness and fatness than their peers. Girls who don't like PE have higher levels of %BF and lower levels of motor and muscular fitness than their peers. Hence, with our results we could banish the myth that obese and unfit adolescents dislike PE in boys, and partially true in girls because (i) we only found differences in 3 of the 6 variables and (ii) these differences were weak. Longitudinal studies are needed to elucidate the sex- and fitness-specific findings found herein.

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References

1. Fairclough S, Stratton G. "Physical education makes you fit and healthy". Physical education's contribution to young people's physical activity levels. *Health Educ Res* 2005; 20: 14-23.
2. Prochaska JJ, Sallis JF, Slymen DJ, McKenzie TL. A longitudinal study of children's enjoyment of physical education. *Pediatr Exerc Sci* 2003; 15, 170-8.
3. Barr-Anderson DJ, Neumark-Sztainer DN, Schmitz KH, Ward DS, Conway TL, Pratt C et al. But I like PE: Factors associated with enjoyment of physical education class in middle school girls. *Res Q Exerc Sport* 2008; 79 (1): 18-27.
4. Castro-Piñero J, Carbonell-Baeza A, Martínez-Gomez D, Gomez-Martinez S, Cabanas-Sánchez V, Santiago C et al. Follow-up in healthy school children and in adolescents with DOWN syndrome: psycho-environmental and genetic determinants of physical activity and its impact on fitness, cardiovascular diseases, inflammatory biomarkers and mental health; the UP&DOWN Study. *BMC Public Health* 2014; 14(1), 400.
5. González-Gross, M, Castillo MJ, Moreno L, Nova E, González-Lamuño D, Pérez-Llamas F et al. Alimentación y valoración del estado nutricional de los adolescentes españoles (Estudio AVENA). Evaluación de riesgos y propuesta de intervención. I. Descripción metodológica del proyecto. *Nutr Hosp* 2003; 18: 15-28.
6. Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ* 2000; 320: 1240-3.
7. Slaughter MH, Lohman TG, Boileau RA, Horswill CA, Stillman RJ, Van Loan MD et al. Skinfold equations for estimation of body fatness in children and youth. *Hum Biol* 1988; 60: 709-723.
8. Leger LA, Mercier D, Gadoury C, Lambert J. The multistage 20 metre shuttle run test for aerobic fitness. *J Sports Sci* 1988; 6: 93-101.
9. Ruiz JR, Castro-Piñero J, España-Romero V, Artero EG, Ortega FB, Cuenca MM et al. Field-based fitness assessment in young people: the ALPHA health-related fitness test battery for children and adolescents. *Br J Sports Med* 2010; 45(6): 518-24.